

## **Pork CRC Initiatives July 2017**

### **Pork CRC confronting hot issues with cool science**

Last month I suggested the next battles on the provenance front will likely need to confront antimicrobial use and resistance and environmental enrichment, firstly of pregnant sows and then all classes of pigs.

#### **Pregnant sows**

Our researchers lead the world in animal welfare and Pork CRC has several well advanced and creative projects on enriching the environment of gestating sows. These include comparing the Ridley sow enrichment block with other strategies, such as straw and hay in racks and a new and novel project on human enrichment. Remember too that we've previously reported on the work of Emma Greenwood, who demonstrated during her Pork CRC supported PhD that play behaviour in group-housed sows to objects hung from ropes above their pens was seemingly the most effective or interesting. Of greatest interest and commercially applicable was that Emma demonstrated that play behaviour actually increased with time. This and the enrichment block I think offer some potentially simple, cost effective enrichment strategies, perhaps along with others which are being investigated. We are also exploring the enrichment block, or a version of it, for grower-finisher pigs.

#### **Farrowing sows**

The farrowing-lactating sow is a different matter and remains challenging. We have investigated most of the freedom type farrowing pens, modifications of these to reduce piglet mortality in summer and systems where sows and piglets are moved to groups after different periods of confinement. None has worked. They inevitably result in increased piglet mortality and even increased sow aggression. In a recent study where sows and litters were grouped at 7 and 14 days after birth, the seven day treatment had to be abandoned because of unacceptably high piglet mortality and in both treatments sow welfare was compromised by aggression, which increased with time after grouping. We have seen similar results with step out type systems.

We are therefore now concentrating our efforts on defining and enhancing the welfare of sows and their litters in conventional systems. I will reveal the outcomes of these projects as they become available, but we certainly have the world's best researchers working on it.

#### **Antibiotic challenge**

You are all aware that the issue of antibiotic use and resistance has global implications and is currently being driven by regulators and retailers overseas. Implementation is being led by the poultry industry. While no antibiotics ever is certainly easier to implement with broilers than weaner-finisher pigs, the more judicious use of antibiotics and monitoring antimicrobial resistance is occurring in pork industries worldwide and being led by the countries which export pork to Australia. We therefore must ensure we don't fall too far behind.

To understand what is affecting our pigs and how disease might be better managed, Pork CRC researchers have developed a range of new diagnostic tests for the common enteric and respiratory pathogens affecting our herds. They even discovered new strains of swine dysentery and a new *Actinobacillus* species, suggesting a continual need for surveillance, as in both cases herds thought to be clean or free from the respective diseases were far from it.

At University of Sydney, Prof Michael Ward and Pork CRC PhD student Lechelle van Breda have just completed one of the most comprehensive studies on E coli across the Australian industry. They

established resistance to veterinarian and human antimicrobials, with resistance to antimicrobials of human importance being generally low. They also provided excellent information on how surveillance programs might need to be adjusted to better detect antimicrobial resistance.

Other researchers and Pork CRC participants have developed alternative strategies for reducing the impact of pathogens such as E coli on animal health and one or two as genuine replacements for antibiotics. Others are exploring novel techniques for combating ileitis using a quantitative PCR developed by Dr Alison Collins at the Elizabeth Macarthur Agricultural Institute, NSW, to monitor the incidence of the bug and treatment effects.

Others are working on vaccines for APP, swine dysentery and Strep suis and cost effective strategies for reducing pathogen loads in sheds, all of which, if successful, will reduce antibiotic use.

### **Gut microbiome**

Arguably, the more interesting outcomes have been the effects of antibiotics on antibiotic resistance and on the gut microbiome. I mentioned in my June Pork CRC Initiatives column that the latter is gaining interest in human medicine, with claims that faecal transplants have altered the phenotype of the recipient – not always favourably. In the pig, Prof John Pluske and his team at Murdoch University have demonstrated nutritionally induced changes in the gut microbiome associated with improved growth performance in E coli challenged pigs and more recently, Dr Alison Collins has reported effects of antibiotics and zinc oxide on antimicrobial resistance and the gut microbiome.

### **E coli challenge**

Alison investigated the effects of the antibiotic Neomycin sulphate and ZnO on the health and antimicrobial resistance of pigs naturally challenged with E coli.

I am not an expert in the field, but think the outcomes are fascinating.

The pigs were weaned at 21 days and moved to separate rooms at EMAI and offered a common diet for six days with the treatments starting on day seven. Neomycin sulphate was added to the experimental diet at 8mg/kg and ZnO at 2500 ppm. The control diet contained no antibiotic or ZnO. The treatments lasted two weeks after which pigs were offered the same basal diet without antibiotics or ZnO for a further three weeks. Control pigs exhibited more diarrhoea than those on all other treatments during the two week test period and 25% of pigs on the antibiotic and ZnO treatments exhibited diarrhoea when the materials were withdrawn.

Dr Collins measured the percentage E coli resistant to a range of antibiotics on day six (the start), during the treatment period and three weeks after treatment. She also assessed the gut microbiome at the same times.

The effects of treatment on the percentage of E coli isolates resistant to some seven commonly used antibiotics was consistent across antibiotics. In general, neomycin increased antibiotic resistance during treatment but this fell back to very low levels following withdrawal. ZnO, however, tended to reduce the level of antibiotic resistance during treatment but elicited increased resistance three weeks after withdrawal and the increase was significant for tetracycline. Using lincospectin as an example – resistance at day six was about 14% (range 12-17%). Over the two week treatment period, resistance increased from 15 to 20 % on the neomycin treatment, stayed relatively constant for the control and fell to zero for the ZnO treatment. Three weeks after treatment, resistance on the previous neomycin treatment fell to near zero and the control was at 5%. For the previous ZnO treatment, resistance had increased from zero to 12.5%.

The implications of the apparent increase in antimicrobial resistance following the use of ZnO is being further investigated, particularly, to see if the resistance was phenotypic or genetic.

The quite large decline in resistance following withdrawal of the neomycin is interesting and raises questions of how the change in resistance is driven, its persistence and the relevance of when it is measured.

Results for changes in the gut microbiome followed a similar pattern as antimicrobial resistance. Neomycin and ZnO markedly disrupted the gut microbiome during treatment but at a gross level this returned to that of the control levels three weeks after withdrawal of the antibiotic and ZnO. The researchers are now looking at changes in the gut bacterial populations in more detail.

As I said, it's an intriguing study with maybe more questions than answers – but a sign of where things are heading in the area. The outcomes also reflect the excellent work being done by researchers across Pork CRC Program 2 ('Herd Health Management'). There is much more to come, and we are lucky to have so many good scientists in the area – I think we will need them.

### Price points

I have summarised the latest global prices below

USA and Canada are enjoying the normal summer increase in demand and prices. EU has seen prices increase in the past few months. In China, price fell again in June and is getting closer to COP.

I'm not sure where we're at in Australia as there is now a marked difference in prices 'reported' by buyers and sellers. Prices given are the average of the two. All seem to have fallen slightly since last month.

To put things in context, COP in the US is now around \$AUD 1.72/kg carcass weight, with feed at \$AUD 276/tonne.

**Table: Latest global pig prices (\$AUD/kg carcass weight) and changes from one month ago**

| Country      | price | Comment |
|--------------|-------|---------|
| Australia*   |       |         |
| 45-60 kg     | 3.12  |         |
| 60.1-75 kg   | 2.90  |         |
| 75.1-85 kg   | 2.86  |         |
| 85 and above | 2.73  |         |
| USA          | 2.46  | Up 40   |
| Canada       | 2.32  | Up 40   |
| Brazil       | 1.76  | Down 20 |
| China        | 3.46  | Down 43 |
| Spain        | 2.85  | Up 19   |
| EU           | 2.70  | Up 16   |

\*Eastern seaboard only

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